

ESTABLISHMENT REPORT  
ALDRIN EVALUATION AREAS  
ON THE  
HIAWATHA NATIONAL FOREST  
UPPER PENINSULA OF MICHIGAN

Prepared by  
Richard F. Fowler  
Zone Entomologist  
St. Paul Forest Pest Control Zone  
Northeastern Area, State and Private Forestry  
U. S. Forest Service, St. Paul, Minnesota

June 30, 1967

(Not for Publication)

ESTABLISHMENT REPORT  
ALDRIN EVALUATION AREAS  
ON THE  
HIAWATHA NATIONAL FOREST  
UPPER PENINSULA OF MICHIGAN

by  
Richard F. Fowler

Introduction

A plan to evaluate the white grub problem in red pine plantations of the Lake States was prepared by Richard F. Fowler and Louis F. Wilson\*. Objective No. 1 of this plan calls for the evaluation of the currently used methods of applying aldrin as a means of grub control. Application of aldrin is the only means of grub control currently being used in the Lake States on National Forests. The Hiawatha National Forest was chosen as the location for this evaluation as it is the only forest equipped with the apparatus for applying this chemical and the only forest currently applying this control measure. Other forests have a known or suspected grub population but some of them are skeptical as to the effectiveness of aldrin as applied by the present methods.

The evaluation was laid out in a randomized complete block design with five blocks in each of five geographic areas. Four plots were established in each block - one for each treatment. The ends of each row of trees in each plot were marked with stakes. The stock used was run-of-the-nursery red pine 3-0 seedlings and 2-1 transplants.

The plots were established during the normal spring planting season of 1967

\*Entomologist - St. Paul Forest Pest Control Zone, State and Private Forestry, St. Paul, Minn. and Insect Ecologist - North Central Forest Experiment Station, East Lansing, Michigan, respectively.

by regular planting crews from each district involved. The crews applied the treatments using the attachments to the planting machine, and a forestry aid applied the hand treatment. The entire planting and treating work was supervised by the entomologist in charge of the evaluation.

### Terms

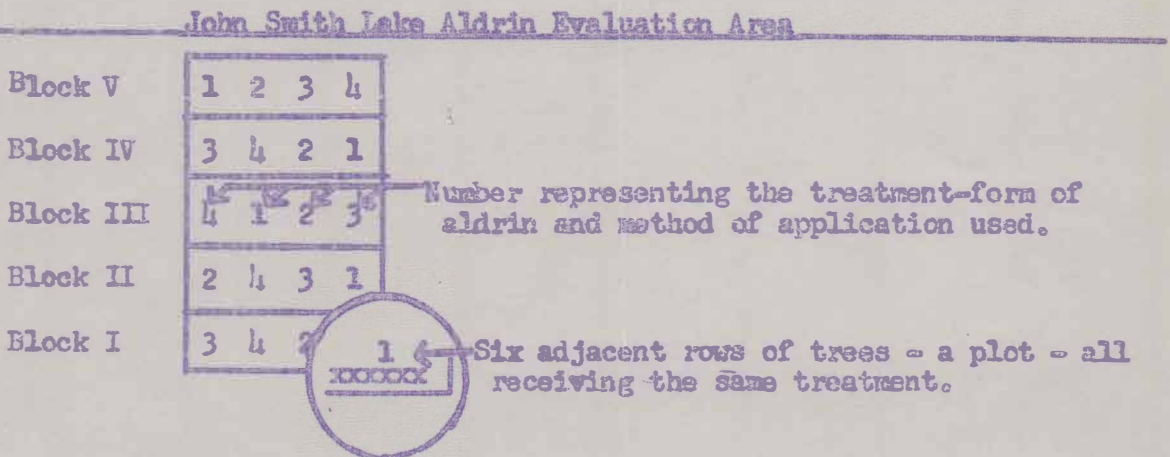
The following terms are defined as used in this report:

Treatment - Any one of the four applications to be used. Each treatment applied once in each block. (See list of treatments below.)

Plot - Group of 6 adjacent rows of trees all receiving the same treatment. Four plots per block - one for each treatment.

Block - Group of four adjacent plots - each plot receiving a different treatment - composing one complete replication.

Area - Group of five adjacent blocks constituting the evaluation activity in one geographic location.



### Treatments

The same four treatments were applied in each of the five aldrin evaluation areas. The treatments are numbered one through four and treatment #1 is the same in each area, as are treatments #2, 3, and 4. The treatments are as

follows:

Treatment 1 - Liquid aldrin applied at the time of planting using the dispenser attached to the planting machine.

" 2 - Liquid aldrin applied after planting using the back-pack pump designed for the purpose.

" 3 - Granular aldrin applied at the time of planting using the dispenser attached to the planting machine.

" 4 - Check - no aldrin applied.

#### Area Locations

The following areas were established (see Figure 1 for locations):

Area Name	District	Legal Description
Raco CCC Camp	Sault Ste. Marie	T46N, R4W, Sec 24, SE $\frac{1}{4}$
Highbanks Lake	Sault Ste. Marie	T46N, R5W, Sec 13, SW $\frac{1}{4}$
Town Hall (Strong's)	Sault Ste. Marie	T46N, R6W, Sec 36, NE $\frac{1}{4}$
Townline Lake	Munising	T45N, R18W, Sec 34, E $\frac{1}{2}$
Bird Area	Manistique	T44N, R18W, Sec 29, NE $\frac{1}{4}$

#### Area Establishment

The proposed sites for the spring 1967 planting program of each of the districts involved were examined by the entomologist prior to the start of the planting season. He chose those areas suspected of having a sizable grub population based on ground vegetation for grub feeding plus suitable host trees and shrubs for adult feeding. Accessability to the areas was also considered since the plots will be visited for one to several days at least three times a year.

A randomized complete block design was used in setting up this evaluation.



Each of the four treatments appears once in each block. The treatments are numbered one through four with each number always represent<sup>ing</sup> the same treatment in each block and area. The numbers were placed in a hat and drawn at random to determine which plot would receive which treatment. Individual drawings were made for each block and each area, resulting in twenty-five separate drawings.

Five blocks were established in each area, and five areas were established on the Forest (see area locations above). The distribution, three on the Sault Ste. Marie Ranger District and one each on the Manistique and Munising Districts, is approximately proportional to the acres planted by these districts.

In order to have five suitable areas spread over the three districts involved, the plot on the Manistique Ranger District was established in an area adjacent to a 1966 plantation in which an appreciable grub population had been observed during the planting in 1966.

The Sault Ste. Marie District was requested to plant in an area that was being held as an alternate planting site to give better distribution of the areas over the district and also because the area appeared to have a better prospect of having a high grub population.

The plots were planted by machine using normal speed and production methods. No special care was exercised in planting the evaluation plots within the larger plantation or in the specially requested areas. The entomologist or his forestry aid assistant walked behind the planting machine counting the trees to determine when the treatment should be changed, and giving instructions to the planter and tractor operator. The planter applied the liquid

or granular aldrin (depending upon which the machine was equipped with) to the trees in the treatment requiring that form of aldrin. The trees to be hand treated and the check plots were planted at the same time without the aldrin attachment on the machine being activated. The plots to be treated by machine application of the other form of aldrin (the form with which the machine was not equipped) were skipped by lifting the machine out of the ground and driving the tractor forward to the next plot. The "skips" were planted at a later date by bringing the appropriate machine into the area (see Table 1). In this manner the test areas at the Soc and Manistique were established with a machine applying liquid aldrin and skipping the granular plots. The area on the Munising district was planted by the machine equipped to apply granular aldrin. At the close of Manistique's planting program their liquid aldrin equipped machine was taken to Munising and the liquid application made by planting and treating the skipped plots. The granular machine was moved to Manistique and to the Soc to finish the plots there. This accounts for the difference in planting dates within each area.

To facilitate economical planting of the areas the blocks were stacked on top of each other and the machines planted across the block lines changing treatment as appropriate or leaving a skip. The crew then continued planting to the end of the plantation and returned, being met at the boundary of the plot to receive instructions as they crossed the blocks. This method avoided the lost time of turning at the end of each block and at the boundaries of the area leaving pieces of the regular plantation to be planted later. The districts donated the labor, machines and trees to plant these plots as they would have been planted regardless of any plots established by the entomologist. The Soc districts donated the time in the alternate area. An agreement was reached with the Manistique District whereby the zone office would

pick up the extra costs incurred by that district in moving their men and machine around. This crew from Manistique moved their liquid machine, then moved Munising's granular machine to Manistique and the Sco to complete the plots there.

The plan specifies that fifteen trees be observed in each row plus two trees on each end to reduce any edge effect. It was observed at the beginning that space for at least twenty-five trees should be allowed per block to guarantee having the minimum of fifteen trees desired, because of lost planting space due to slash, stumps and other obstacles. An effort was also made to keep the boundaries of the plots as straight as possible, thus a variable number of trees are planted in each row. The middle fifteen trees in each row will be observed. The number of trees in each row of each treatment was counted and mapped, noting the unplanted areas within the rows.

#### Plot Marking

The plots are marked with 1"x2" stakes. The tops of the stakes marking the ends of the outside rows of each plot are painted with two orange bands. The tops of the stakes marking the ends of the interior rows are painted with one orange band (see maps of plots for each area).

#### Stock

All the districts were planting 3-0 red pine seedlings from the Chittenden Nursery in Welston, Michigan. The stock used in the plots is run-of-the-nursery stock as used by the districts in their normal planting practices. No effort was made to have stock lifted especially for the evaluation or handled in any special way. The stock was used as it came from storage on



the district without regard for the nursery bed from which the stock originated. To do otherwise might invalidate any correlations between survival within the areas and in the surrounding plantation. This non-selection may also avoid unusually poor or good survival within the evaluation areas by eliminating the possibility of using all poorer quality or "diseased" stock or all exceptionally "healthy" stock from a single location in the nursery bed.

One problem did arise in that 2-1 rather than 3-0 stock was received on the mid-season shipment. This resulted in the treatment "skipped" during the first planting being planted later with 2-1 stock (see Table 1). This means that in the three areas at the Soo the granular aldrin treatment was planted with 2-1 stock whereas at Munising the liquid aldrin by machine treatment was planted with 2-1 stock. The entire area at Manistique was planted with 2-1 stock. This change in the type of stock is not too serious in that the analysis of the data can still be made among the 3-0 stock in all areas and between the treatments in the five blocks (replications) at Manistique as all the treatments are on 2-1 stock. At Munising the granular aldrin, liquid aldrin by hand application and the check can be compared. In the same manner the performance of granular aldrin in the three Soo areas and the Manistique area can be compared. Inferences can be drawn from other comparisons.

The stock on all five areas was handled in the same manner in that none of it was dipped in foligard even though the Soo district used this material on the stock planted in their regular program. At the Soo, the entomologist carried untreated stock into the field and loaded the planting machines with it when they were working in the evaluation areas.



### Chemical Treatment

The liquid aldrin is obtained in liquid concentrate form. It is mixed with water at the district to obtain the prescribed 1% active formulation.

The granular aldrin comes in a 20% active formulation. This was used in the planting machine directly without any further mixing. No fertilizers or other additives were put into the aldrin used on these plots.

### Observed Grub Population

The grub population in the evaluation areas will be measured by taking thirty one-cubic-foot samples systematically arranged over each area. In addition, the grubs and beetles turned out by the planting machines were counted and recorded. The tally is as follows: Soo CCC Area-38 grubs and 3 adults, Highbanks Lake-6 grubs and 0 adults, Town Hall-100 grubs and 9 adults, Townline Lake-40 grubs and 5 adults, and Bird Area-30 grubs and 11 adults. These figures are not completely comparable as the counts were not made at the same interval of time after planting, but may provide an interesting comparison with the cubic foot sampling. One of the early methods for determining grub populations in farmers' fields was to count the number of grubs per mile of furrow.

A flock of forty to fifty blackbirds followed the planting machine in the Town Hall Area (100 grubs). Those grubs counted were lightly covered with soil to protect them from the birds, to prevent the reduction in population since no flocks of birds were seen in any of the other areas.

### Summary

The five areas designed to evaluate the effectiveness of the currently used methods of applying aldrin as a means of grub control were established on the Hiawatha National Forest between April 25 and May 31, 1967. Regular planting crews from each district were used. The trees were regular planting stock from the district warehouse.

The four treatments were: 1-liquid aldrin by machine, 2-liquid aldrin by hand, 3-granular aldrin by machine, and 4-no aldrin. They were applied at random to the plots during or shortly after planting. These plots were marked with painted stakes.

The planting stock used was ~~run-of-the-nursery~~ stock. Both 3-0 stock and 2-1 stock were used. This was not by choice but rather was due to an unanticipated change in stock between shipments from the nursery.

These areas will be evaluated periodically as specified in the "Plan for the Evaluation of the White Grub Problem in Red Pine Plantations of the Lake States" by Fowler and Wilson, February 6, 1967 (Revised March 20, 1967.)

Table 1. SUMMARY OF ESTABLISHMENT DATA

Treatments	Aldrin Evaluation Areas				
	Bird Area Manistique	Townline Lk. Manising	Highbanks Lk.-Soo	Race CCU Soo	Townhall Soo
1-Liquid aldrin by machine					
Date planted	5/25/67	5/26/67	4/25,26/67	5/15/67	5/22/67
Date treated	5/25/67	5/26/67	4/25,26/67	5/15/67	5/22/67
Stock	2-1	2-1	3-0	3-0	3/0
2-Liquid aldrin by hand					
Date planted	5/25/67	5/17,18/67	4/25,26/67	5/15/67	5/22/67
Date treated	5/25/67	5/18/67	5/16/67	5/15,16/67	5/23/67
Stock	2-1	3-0	3-0	3-0	3-0
3-Granular aldrin by machine					
Date planted	5/26/67	5/17,18/67	5/31/67	5/31/67	5/31/67
Date treated	5/26/67	5/17,18/67	5/31/67	5/31/67	5/31/67
Stock	2-1	3-0	2-1	2-1	2-1
4-Check					
Date planted	5/25/67	5/17,18/67	4/25,26/67	5/15/67	5/22/67
Date treated	-	-	-	-	-
Stock	2-1	3-0	3-0	3-0	3-0

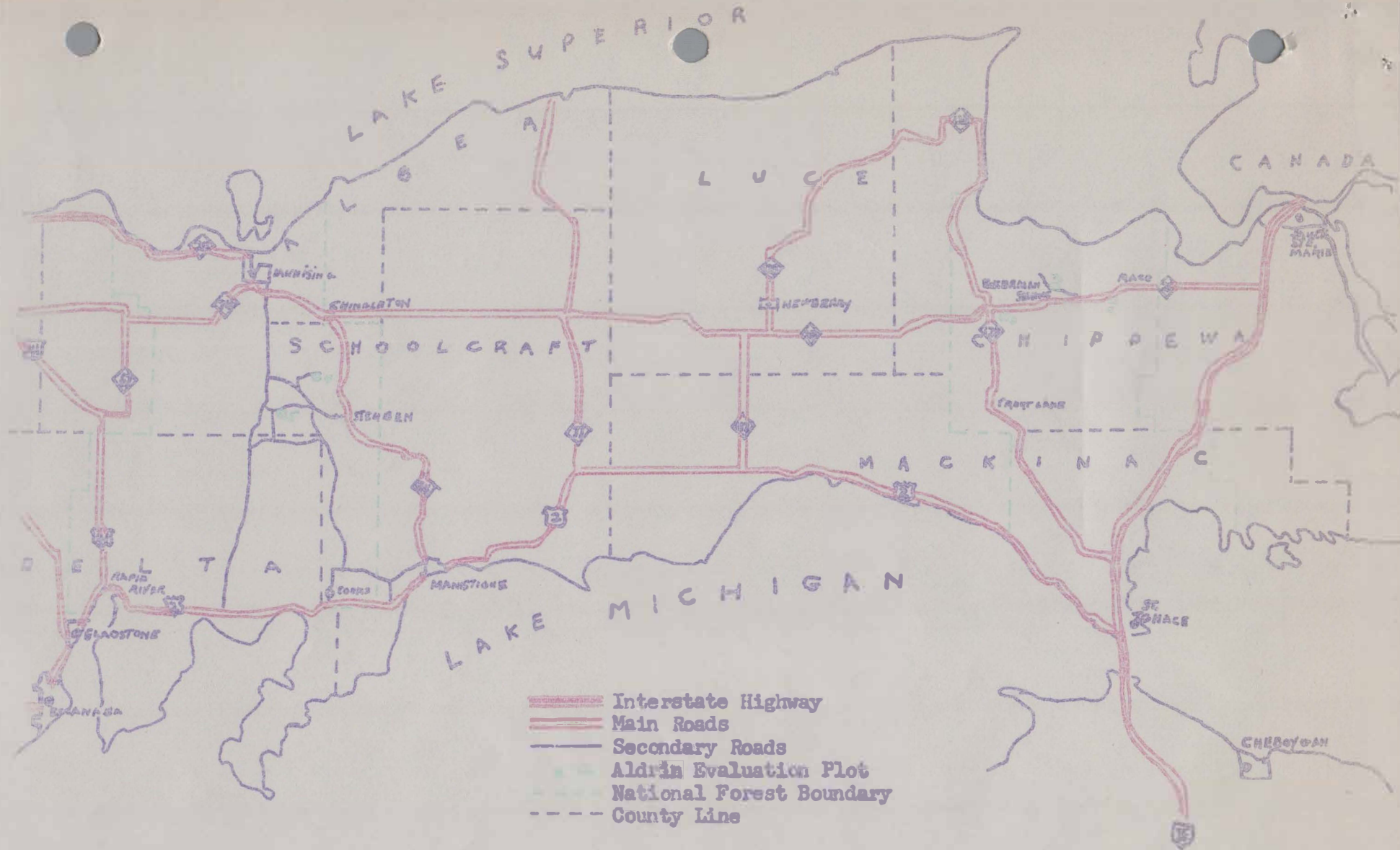


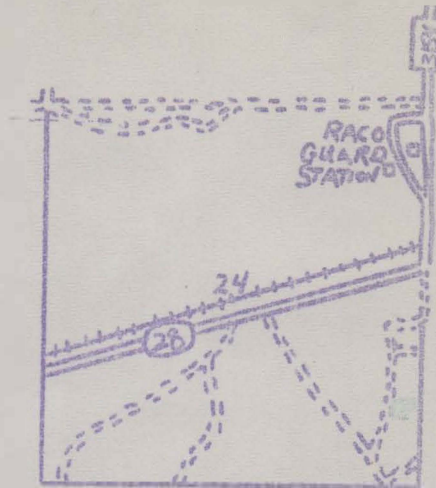
FIGURE 1: LOCATION OF ALDRIN EVALUATION PLOTS



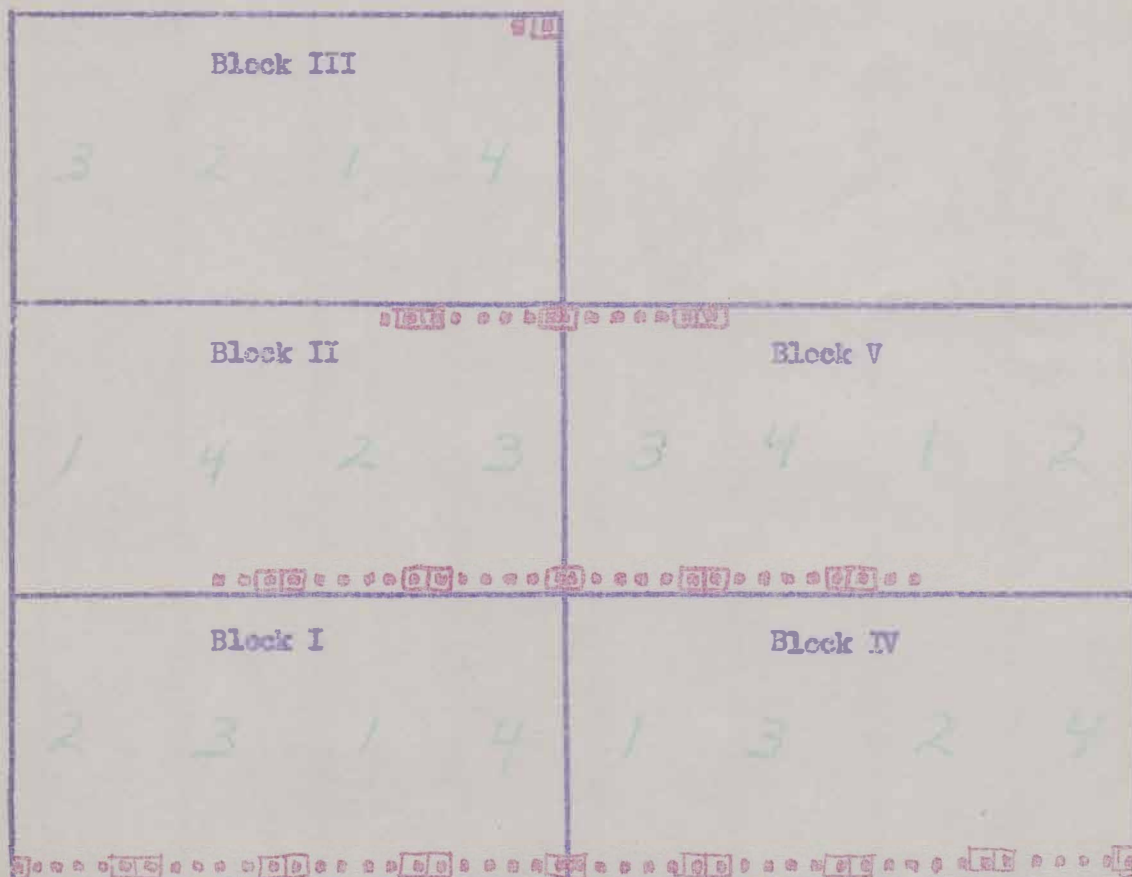
# RAGO CCC CAMP ALDRIN EVALUATION AREA

T46N, R4W, Sec 24, SE $\frac{1}{4}$   
Sault Ste. Marie Ranger District

- ==== Gravel Road
- ==== Rut Road
- Power Line
- ~ River
- Aldrin Evaluation Area
- Stake painted with one band
- Stake painted with two bands
- Number of the treatment applied to this plot



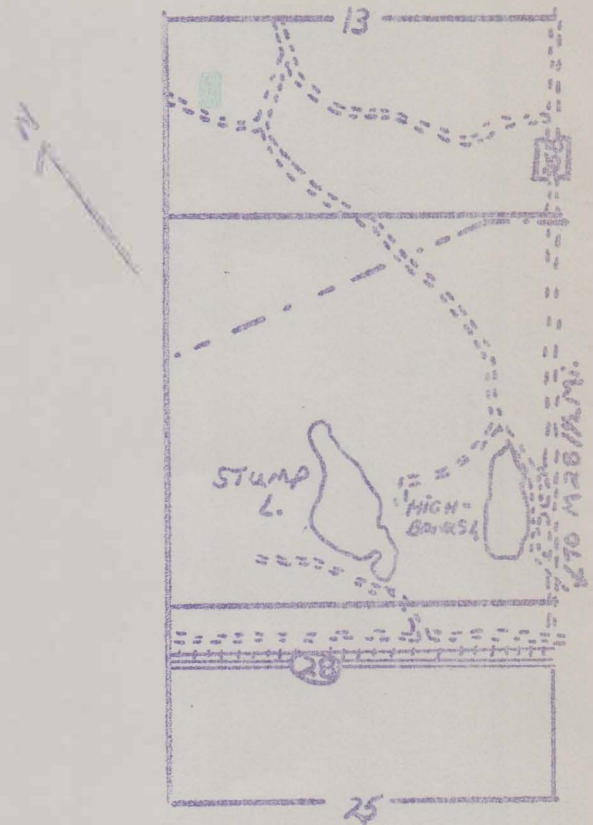
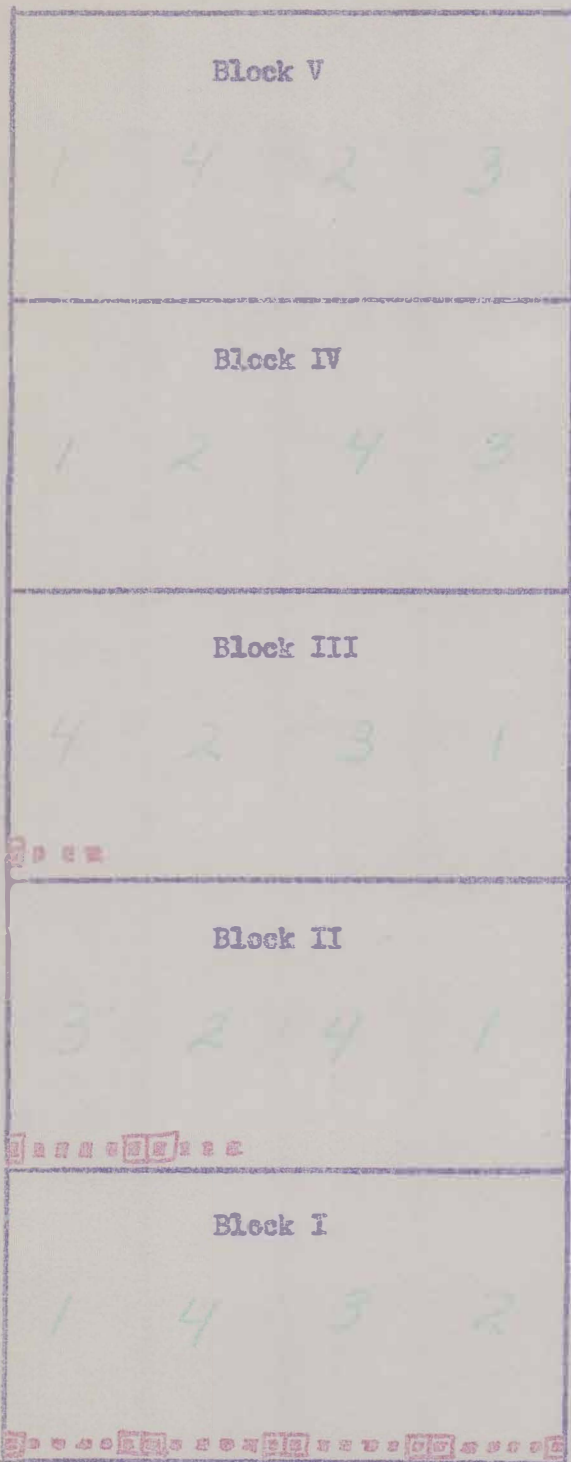
N



42410 42411 42412 42413 42414 42415 42416 42417 42418 42419 42420 42421 42422 42423 42424 42425 42426 42427 42428 42429 42430 42431 42432 42433 42434 42435 42436 42437 42438 42439 42440 42441 42442 42443 42444 42445 42446 42447 42448 42449 42450 42451 42452 42453 42454 42455 42456 42457 42458 42459 42460 42461 42462 42463 42464 42465 42466 42467 42468 42469 42470 42471 42472 42473 42474 42475 42476 42477 42478 42479 42480 42481 42482 42483 42484 42485 42486 42487 42488 42489 42490 42491 42492 42493 42494 42495 42496 42497 42498 42499 42500

# HIGHBANKS LAKE ALDRIN EVALUATION AREA

T46N, R5W, Sec 13, SW $\frac{1}{4}$   
Sault Ste. Marie Ranger District

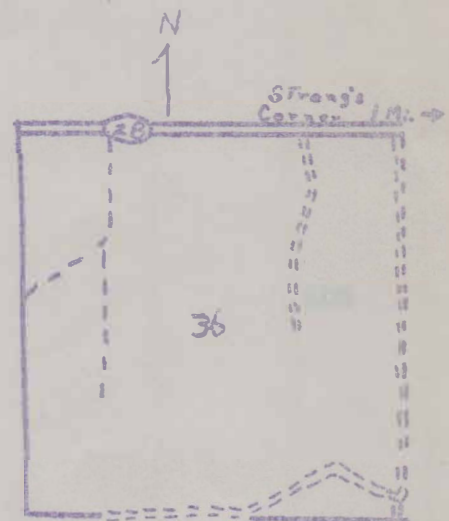
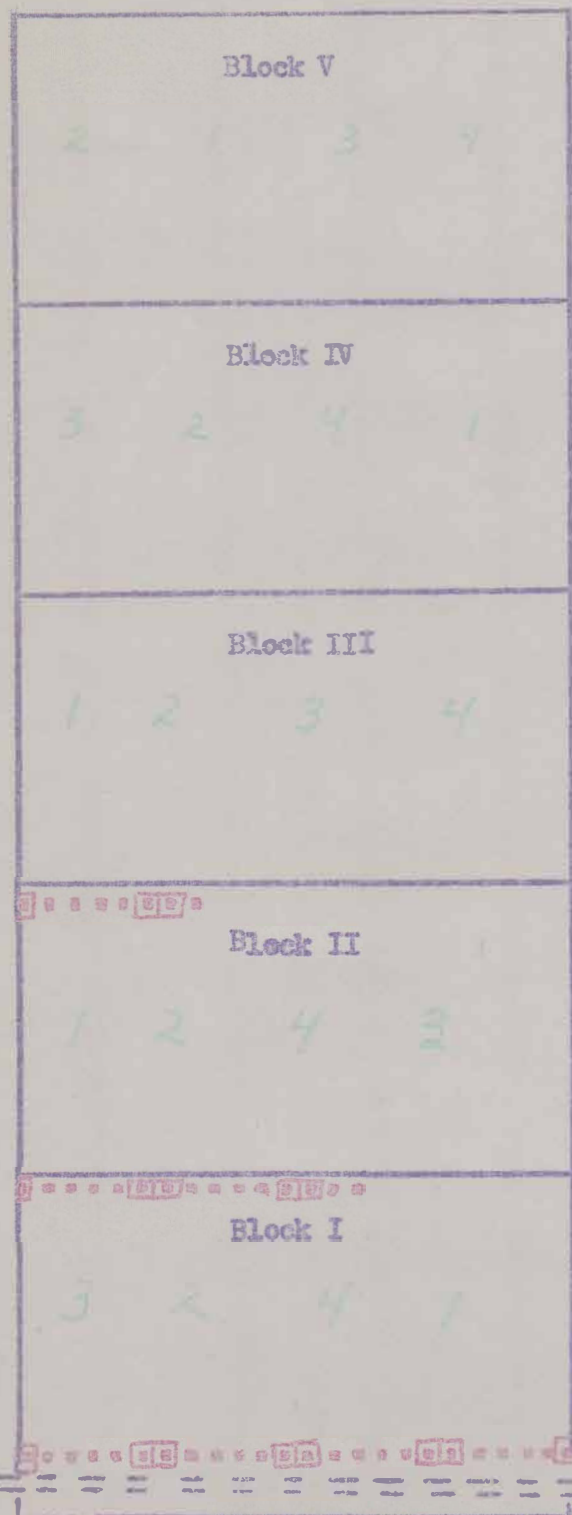


- Gravel Road
- Dirt Road
- Power Line
- River
- Aldrin Evaluation Area
- Stake painted with one band
- Stake painted with two bands
- Number of the treatment applied to this plot

# TOWN HALL ALDRIN EVALUATION AREA

T46N, R6W, Sec 36, NE $\frac{1}{4}$   
Sault Ste. Marie Ranger District

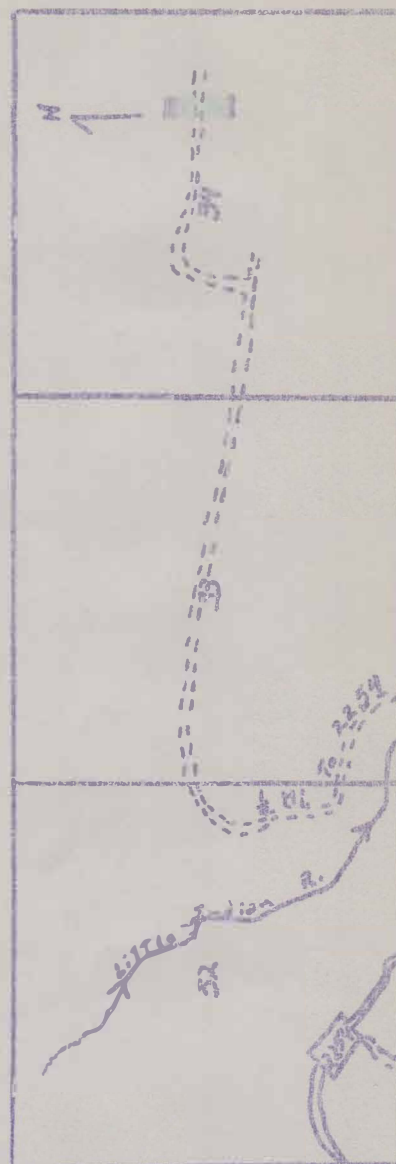
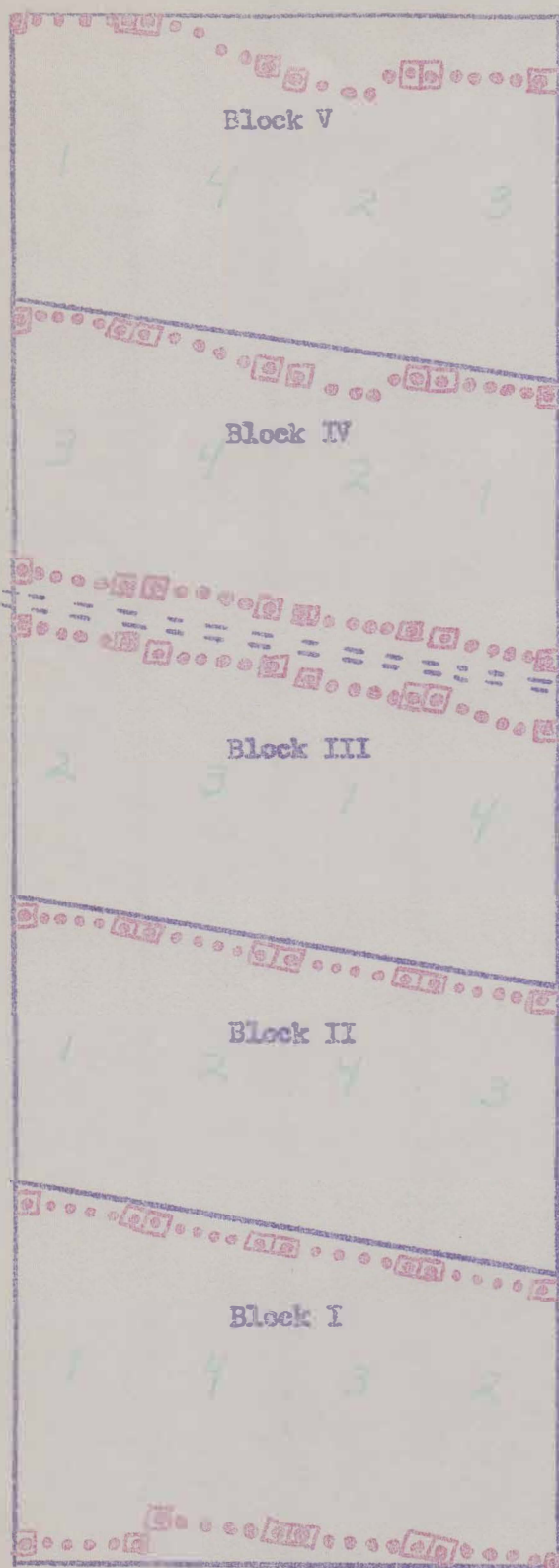
Z ←



- ==== Gravel Road
- Rut Road
- - - - Power Line
- ~~~~~ River
- █ Aldrin Evaluation Area
- Stake painted with one band
- Stake painted with two bands
- 2 Number of the treatment applied to this plot

# TOWNLINE LAKE ALDRIN EVALUATION AREA

T45N, R18W, Sec 34, E $\frac{1}{2}$   
Munising Ranger District

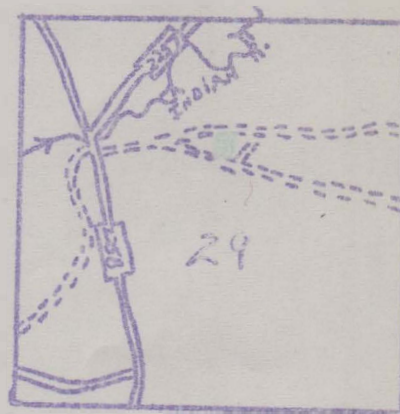
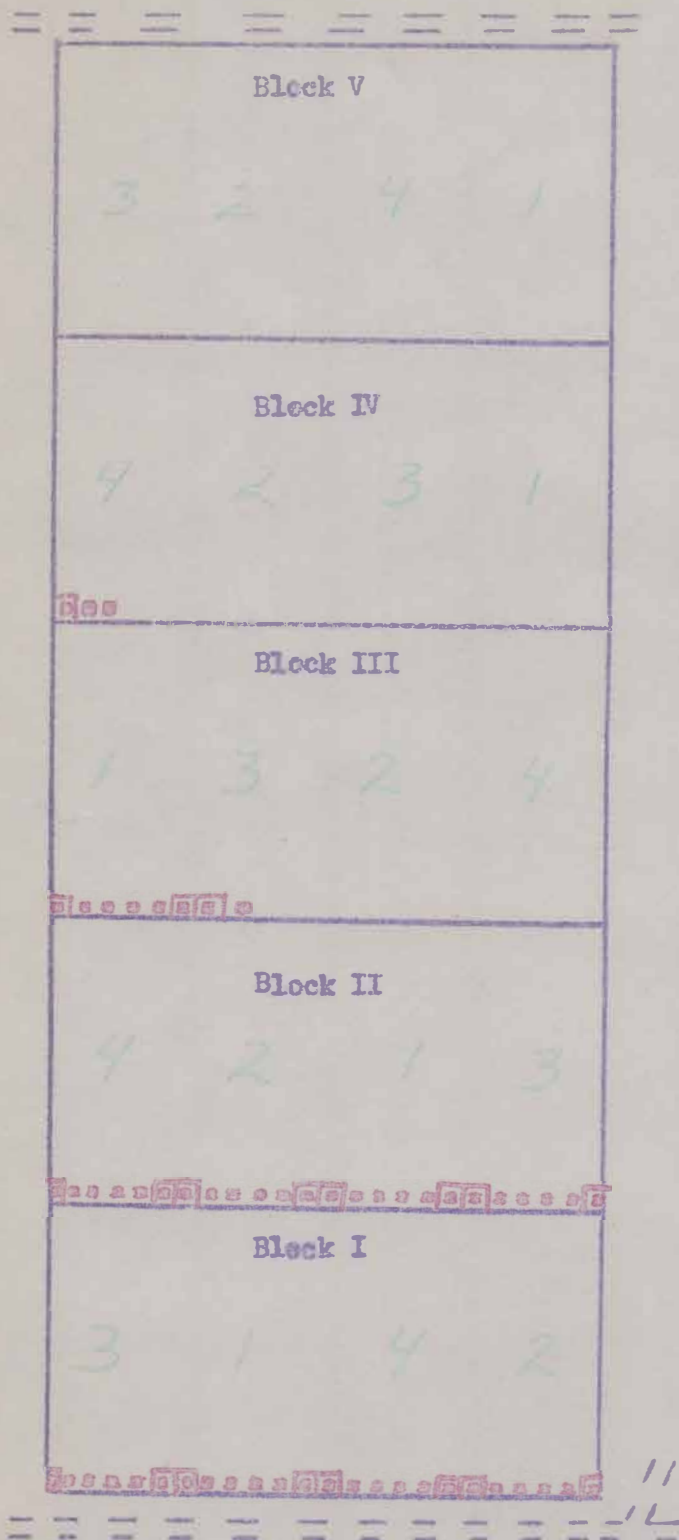


- Gravel Road
- Rut Road
- Power Line
- River
- Aldrin Evaluation Area
- Stake painted with one band
- Stake painted with two bands
- Number of the treatment applied to this plot



# BIRD AREA ALDRIN EVALUATION AREA

T44N, R18W, Sec 29, NE1/4  
Manistique Ranger District



- ==== Gravel Road
- ==== Rut Road
- Power Line
- ~ River
- █ Aldrin Evaluation Area
- ⊙ Stake painted with one band
- ⊞ Stake painted with two bands
- █ Number of the treatment applied to this plot